**Mycotoxin Matters Podcast ep 5 V1**

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Female: Welcome to the Mycotoxin Matters Podcast from Alltech Mycotoxin Management. As mycotoxins present an ever-increasing threat to livestock production, join us as we discuss these impacts and potential solutions, sustainable farming, and our vision for a planet of plenty.

Nick: Hi. My name is Nick Adams, the Global Director for Alltech's Mycotoxin Management Team, and you're very welcome to this episode of Mycotoxin Matters where we're joined by Dr. Max Hawkins. Max works with risk assessment of feedstuffs and feeds as they relate to the impact of mycotoxins on all species. He brings years of experience that includes not only mycotoxin management but also livestock production, nutrition, breeding, and genetics covering all different livestock species. Max, welcome to Mycotoxin Matters.

Max: Thank you, Nick. I'm certainly glad you had me with you this morning.

Nick: Well, Max, today we're going to pick up and talk around the concept of forages and mycotoxins. Obviously, when we think about forages within the concept of the ruminant diet, they're increasingly important when we think about the cost of diets, when we think about where forages have come in terms of digestibility, their contribution to the ruminant diet. When we think about then the concept of mycotoxins, that's really where we want to pick up. Maybe we could start by having you just give us a little bit of an overview about what you're seeing generally speaking with forages this year in terms of mycotoxins.

Max: Well, this year in terms of mycotoxins, it's a little bit similar to previous years and a little bit dissimilar to previous years. Every year, we do experience mycotoxin issues, but the severity of that and which mycotoxins may be involved do tend to vary. In North America, from corn silage this year, we didn't see as high a risk on average even though the majority of that risk still comes from Fusarium mycotoxins such as the Type B trichothecenes, Type A trichothecenes, fumonisins, zearalenone, emerging mycotoxins. Those are all still prevalent but at somewhat lower risk levels on average.

 We know that weather is a significant influence on Fusarium production. It likes moderate temperature and higher levels of moisture through either rain or humidity. In certain parts of the country this year, that's exactly what we had. We had somewhat of a droughted summer and then late season rains for two to three weeks prior to harvest across that area. We have had extremely high levels of Type B trichothecenes, Fumonisins in those areas, more Eastern Corn Belt, if you're familiar with the US. As we went through Europe this year, trichothecenes were a little bit higher, but we still have the predominant pressure of Penicillium and storage mycotoxins primarily because of the crop that we have with the prevalence of grass silages versus the corn silages from North America. So we still have the risk from the same groups of mycotoxins year in and year out. The severity of those will change with weather patterns and impact on the crop.

Nick: If we think about that, the different types of forage that we may be putting up in different parts of the world, that is one thing that will determine the types of molds and mycotoxins, also then the climate side of things. So when we think down to an individual farm level, how much may the mycotoxin picture on an individual farm change from the other farms in that county or that state, for example? Is it really coming down to that microclimate at the farm level?

Max: I feel very much so. Mycotoxins and the molds that generate these mycotoxins can be very microclimate, that are microgeographic areas. If you would think of a cornfield and the variation in the corn quality from end to end and side to side, not every corn plant in that field is equal in terms of growth and development and maturity.

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 Therefore, we have that same amount of variation across that field that mold can be a more significant or less significant influence. Plant health is going to certainly vary, and therefore, mycotoxin challenge is going to vary throughout that field. That may be a problem with the neighboring field. It may not be a problem with the neighboring field. Were they all planted on the same date? Did they use the same variety of corn? Did they use the same amount of fertilizer, herbicide, fungicide, insecticides? Those things all vary farm to farm. It may rain on my farm today. You're a mile down the road and you've got no rain today. Those things can all play into significant factors.

Nick: So Max, if we look at the information from some of the analysis that you've done over the past year or so, do you see the scenario where certain farms may have no mycotoxins and other farms may have really, really high levels of mycotoxins or is it not quite so simple as that?

Max: Well, it's not quite as simple as that, but in the producer's eyes, it is. I'm working with a situation in the northern part of the US now where there's one very, very small group. It's almost one farm, as a matter of fact, that's extremely high with trichothecenes, and yet the surrounding farms are all very low risk. One farm has no trichothecenes present. It all comes down to when those fields got planted. In terms of what I'm being able to find out, when those fields were planted, harvested, and the stage of maturity of the plant when they were impacted by severe rain event. So that one farm just happened to be at the right stage of maturity when they got pretty much a torrential rainstorm and it has impacted itself with extremely high trichothecenes levels.

Nick: You mentioned earlier some of the different factors to fungicide use, et cetera, and you're talking about climate now. Clearly then, lots of different things, depending on how they all come together on a particular day or a series of days, that combined effect is going to determine what type of mycotoxin risk that farm harvests in a particular year.

Max: That is true. To further compound that, particularly here in North America, as we have made dairies larger, more cows in one location or feeding more cows out of one location, it's meant that instead of us taking all that variation from one or two fields, now we take all that variation from maybe 20 or 30 fields over a bigger geographic area, and we bring all of that variation into one or two silage facilities. Not only do we have to worry about what was local, but now we have to worry about the variation that we have imported from a larger geographical area and put it into one feed facility that now we're going to be forced to manage that for the entire year. We've somewhat compounded that problem. If you look at it from climate change, weather pattern, those have all been significant factors, but the scale of production and management have also contributed to that risk issue.

Nick: In terms then of understanding that risk, Max, what does that tell us about testing, the need for testing, what type of testing? How are producers, nutritionists, veterinarians trying to start to get their minds around understanding that risk and how it's evolving?

Max: I would say an industry as a whole, Nick, is that they're much more interested in it. They give it much greater attention and significance in terms of its impact or potential impact on production. Many times, a nutritionist is not terribly interested in analysis right at harvest because their primary focus is nutrition to the cows. And so they're much more interested in a nutritional analysis after fermentation, and we open that up and begin to feed it. That's when they'd like to more than likely do a mycotoxin analysis.

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 If we want to be educational in this and do some training and show what is possible, we need to be able to do an analysis at both the harvest and when we open up to begin feeding after fermentation. This set of weather circumstances, growing season circumstances, harvest challenges has created this level of mycotoxin, and that level of mycotoxin has done this through the fermentation process. That's what we now have to challenge the cows with.

 So if we want to be able to help a producer better identify challenges during the growing season, improve on harvesting, and filling silage facilities, we need that analysis at harvest. It's a great teaching tool. It's a great information tool. And then we use that data to further study what happens during fermentation so that we know the exact challenge that we put in front of the cows later on in the year.

Nick: One of the things that you've touched on was the different types of crops, and maybe we pick up on that now as you've talked about some of that risk that comes during the storage. You've talked about corn or maize, silage and grass. What are some of the differences there as you see the risk? And then how does that translate into that storage phase particularly?

Max: Well, primarily the challenges that we see with samples that come into our labs or samples that even our RAPIREAD system reports, when we look at corn silage, we're looking at primarily Fusarium mycotoxins at harvest, DON, T-2, HT-2, zearalenone, fumonisin. That group of mycotoxins that are generated by Fusarium molds, as you well know, those can present serious risks to animal health and performance. Intakes, production levels, gut health, immune response can all be severely impacted.

 That can be somewhat of an issue if we go to small grain silages, wheatlage, barlage, those types of forges. Fusarium tends to be a greater impactor there, maybe not as significant as it is with corn or maize silage, but still the main issue. When we hit the grass silages, we tend to not have as much Fusarium particularly if we've had adequate growth on the grass and we're not really trying to harvest it, cut it extremely low and pull in more soil if there are higher ash contents. We tend to be less risk with Fusariums, not to say they're not present, but they'll be present at typically much lower levels. But then we tend to get into more of the storage mycotoxin issues with the Penicillium and some of the other Aspergillus molds that become the big problem.

 The problem will manifest itself even more as the crop, whichever crop it is, has been stressed more or delayed in harvest. So if we get it in drier, we get less compaction. We get greater oxygen penetration. We can almost guarantee that we're going to have increased levels in Penicillium and other Aspergillus mycotoxins. Penicillium can be a very significant impact as I think you've seen in the UK over the past couple of seasons in Penicillium. We went through some dry weathers, had some mature, dry forages that got harvested and lost in compaction, and Penicillium levels were quite high.

Nick: If you look at the different types of mycotoxins in what we're talking about, you've said there, Max, that during storage, some of these mycotoxins can evolve, can increase depending on the conditions. Are there scenarios where some of those mycotoxins may decrease in storage? What's the experience around that concept?

Max: Well, typically when I'm working with producers working with our people out in the field, I try to emphasize from the point that these forages are from a mycotoxins standpoint. The best they'll ever be is the day that they're harvested. What you really hope for is that that level stays the same, clear through feed out because they do have the opportunity to increase during storage.

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 A lot of that is dependent, as we just talked about, on the health of the plant, the stage of maturity of the plant at harvest, moisture content, compaction, reducing oxygen penetration. All of those things, they play into it greatly as to what's going to happen during that fermentation and storage process.

 Now, there's currently a new paper that's out from Van Dyke ***[0:15:28] [Phonetic]*** that would indicate that there had been a decrease in Fusarium mycotoxins throughout that fermentation process. They didn't see that decrease necessarily in the Penicillium and Aspergillus. I think that the decrease somewhat surprised them in the Fusariums. I would say that we typically do not see that in the field. So what it has done for me and what I'm looking at coming up this year is that we're going to take a much greater insight into that and really try to identify some silages that do have a challenge, some that don't necessarily have a challenge, do some exact measuring at harvest.

 We may even do some more analysis throughout fermentation and then certainly at the end of fermentation. But I think that's going to depend a lot, too, not only on what has stressed that plant prior to, but also where is that decrease happening within the silage facility itself. Is it in the upper level, the middle level, the lower level, the shoulders? Where is that decrease actually happening? If we know where it's happening, we may be able to know those exact factors that contribute to a decrease if there is a decrease.

Nick: Maybe then as we start to wrap up, we've talked about these different types of mycotoxins, the Fusarium mycotoxins that come before the harvest typically, and then the Penicillium mycotoxins that come typically more so after the harvest during storage. When the cow consumes the silages, the feeds that contain these mycotoxins, what happens to the mycotoxins? How well is the rumen adapted to try and deal with these mycotoxins so to speak?

Max: The rumen is our friend when it comes to mycotoxins. The rumen does have the ability to break down or denature certain mycotoxins, and that's primarily due to protozoa action. There is some bacterial action, but the greatest percent of it would be from protozoa. The issue is that some mycotoxins are much more stable. In other words, it's a bigger challenge to break down that molecular structure. The other thing is that it takes a specific protozoa or group of protozoa to impact each different group of mycotoxins. So we have to have a broad protozoa population in adequate numbers to get the greatest effect. The other thing is as we try to run more dry matter through a rumen in a shorter period of time, the mycotoxin has less contact with the protozoa, so more will bypass the rumen and get into the lower gut.

Nick: Is there any difference in some of those individual mycotoxins or do they all get seen by those protozoa and those bacteria in the same way? Are they all broken down to the same extent or are there differences in that, Max?

Max: There are differences because we know that the passage rate of certain mycotoxins is greater than others from the rumen to the lower gut. Some mycotoxins such as fumonisin, there's not a significant protozoa that breaks down fumonisin. So the greatest percent of fumonisin passes right on through the rumen that will accumulate in the lower gut, and in particular, the liver. So we do know that there are differences in the rate at which these mycotoxins are broken down.

Nick: That's great, Max. I really appreciate all of the time and the comments and information around the concept of mycotoxins and forages and what you've seen in the field over these past few months. Before we go, are there any final comments that you'd like to leave our listeners with as they contemplate looking forward to this next harvest? What perhaps should be on their mind?

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Max: Well, the next harvest is always the question that we get asked. We're springtime here in North America now and I've already had questions about what do I think will be in corn silage this fall. The corn grain that we're going to plant is still in the bag in the shed and hadn't even touched soil yet, so we're a little bit premature in terms of that. But the weather forecast looks like it's going to be a dry summer, so that can pose a challenge with stress on the plant. That could bode for somewhat higher mold infestation, but time will tell.

 I just tell people don't do forages by the calendar. Be sure to go out and check your field for plant health, plant maturity, and make decisions based on what you see, not on a date on a calendar that you would typically harvest. It's nice to know when you harvested last year, but maybe you harvested it too late last year, so we don't want to repeat that again. Our Mycotoxin Management Program is not one thing. It's not just a test. It's not just a compaction study. It's not just how well cows eat feed. It's not just about a product to help remediate mycotoxin challenge. It's everything put into one complete program. The more data, the more information, the more observation that we can generate and put into that program or that library of information, we're going to be much more successful in controlling that mycotoxin risk as it's placed in front of the cows on a daily basis.

Nick: Max, many thanks for your time today. Great advice to leave our listeners with and I really appreciate your time.

Max: Thank you, Nick. A pleasure to do it and I hope to follow up with some of the things we talked about later on.

Female: We hope you enjoyed listening today and we look forward to you joining us next time on the Mycotoxin Matters Podcast. For more information on the topics discussed, please visit knowmycotoxins.com. That's knowmycotoxins.com.

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